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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/758,669	SAPP, MARKUS	
	Examiner	Art Unit	
	Hugh Jones	2128	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02 July 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-17,19-34,36-43 and 45* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-17,19-34,36-43 and 45* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *3/21/2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 1-17, 19-34, 36-43, 45 of U. S. Application 10/758,669, filed on 1/14/2004 are pending.

Double Patenting

2. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

3. Claims 1-17, 19-34, 36-43, 45 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over patented claims 1-30 of U.S. Patent Application No. 10/949/464. Claims **1-17, 19-34, 36-43, 45** are anticipated by claims 1-30 in that claims 1-30 contain all the limitations of claims **1-17, 19-34, 36-43, 45** of the instant application. Claims **1-17, 19-34, 36-43, 45** of the instant application therefore are not patentably distinct from claims 1-30 and as such are unpatentable for obviousness-type double patenting.

4. This is a provisional obviousness-type double patenting rejection. There is no functional or mathematical distinction between simulating self-sustained vibrations on a string and simulating the string as in the copending application. Furthermore, a component in a third direction does not preclude components in the first and second directions.

5. Amended claim 1 of the instant application is:

> 1. (Currently Amended) A machine-implemented method comprising:
>
> creating a sound by simulating self-sustained vibration of a ~~simulating a player blowing along a string of a musical instrument with a force acting on the~~ string having a movable end, the string subject to a force exerted by a stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string; and
>
> relating an excursion in time of the movable end to the force and relating movement of the string in time to the excursion of the movable end to simulate the self-sustained vibration; ~~and~~
>
> ~~simulating the movement of the string to cause generation of a sound.~~

6. Amended claim 1 of 10/949,464 is:

> 1. (Previously Presented) A method, comprising:
>
> simulating a string using a wave equation that relates movement of the string in time to force acting on the string, wherein the string has a longitudinal axis in a first direction and is moveable in a second direction orthogonal to the first direction, and the force acting on the string simulates a stream of a fluid medium flowing relative to the string in a direction having a component in a third direction orthogonal to both the first and second directions; and
>
> creating sounds using the wave equation.

The definition for “self-sustained” is provided in paragraph 26 of the specification:

> [0026] Several methods for exciting such a simulated string and hence applying a force to the discrete elements are known. …. The term "self-sustained" is a specific term for an oscillation that is driven by a continuous energy source. In particular, self-sustained oscillations arise when a continuous energy source

drives a resonator--such as a string under tension--by means of a non-linear energy coupling.

A stream of fluid (as in the copending claims) provides for a *steady-state driving force* – and causes 'self-sustained' vibration.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

8. Claims 1-17, 19-34 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 1, for example, recites:

> 1. (Currently Amended) A machine-implemented method comprising:
>
> creating a sound by simulating self-sustained vibration of a ~~simulating a player blowing along a string of a musical instrument with a force acting on the~~ string having a movable end, the string subject to a force exerted by a stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string; and
>
> relating an excursion in time of the movable end to the force and relating movement of the string in time to the excursion of the movable end to simulate the self-sustained vibrations ~~and~~
>
> ~~simulating the movement of the string to cause generation of a sound.~~

The claims essentially recite mixing 'real' and simulated phenomena. "Creating a sound" appears to refer to creating an *actual sound*. However, a *real sound* cannot be created just by *simulating the vibrations* of a string. To be consistent, a 'simulated

sound' can be created with a simulation of the vibrations. Please note the new 101 rejections in this context.

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claims 1-17, 19-34 are rejected under 35 U.S.C. 101 as being directed to nonstatutory subject matter since the claims as a whole do not provide for a practical application and there is no physical transformation or a useful, tangible, and concrete final result.

11. The claims are directed to mathematical algorithms with no practical application.

12. The following analysis is required in order to determine whether the claimed invention complies with 35 USC 101. See MPEP 2106:

> **Determine Whether the Claimed Invention Falls Within An Enumerated Statutory Category**
>
> To properly determine whether a claimed invention complies with the statutory invention requirements of 35 U.S.C. 101, USPTO personnel must first identify whether the claim falls within at least one of the four enumerated categories of patentable subject matter recited in section 101 (i.e., process, machine, manufacture, or composition of matter).
>
> **Determine Whether the Claimed Invention Falls Within 35 U.S.C. 101 Judicial Exceptions – Laws of Nature, Natural Phenomena and Abstract Ideas**

Determining whether the claim falls within one of the four enumerated categories of patentable subject matter recited in 35 U.S.C. 101 (i.e., process, machine, manufacture, or composition of matter) does not end the analysis because claims directed to nothing more than abstract ideas (such as mathematical algorithms), natural phenomena, and laws of nature are not eligible for patent protection (citations omitted).

Determine Whether the Claimed Invention Covers Either a 35 U.S.C. 101 Judicial Exception or a Practical Application of a 35 U.S.C. 101 Judicial Exception

Determine Whether the Claimed Invention is a Practical Application of an Abstract Idea, Law of Nature, or Natural Phenomenon (35 U.S.C. 101 Judicial Exceptions)

For claims including such excluded subject matter to be eligible for patent protection, the claim must be for a practical application of the abstract idea, law of nature, or natural phenomenon (citations omitted). A claimed invention is directed to a practical application of a 35 U.S.C. 101 judicial exception when it:

(A) "transforms" an article or physical object to a different state or thing; or

(B) otherwise produces a useful, concrete and tangible result, based on the factors discussed below.

Determine Whether the Claimed Invention Preempts a 35 U.S.C. 101 Judicial Exception (Abstract Idea, Law of Nature, or Natural Phenomenon)

Even when a claim applies a mathematical formula, for example, as part of a seemingly patentable process, USPTO personnel must ensure that it does not in reality "seek[] patent protection for that formula in the abstract." ..."Phenomena of nature, though just discovered, *mental processes*, *abstract intellectual*

> *concepts* are not patentable, as they are the basic tools of scientific and technological work."... One may not patent a process that comprises every "substantial practical application" of an abstract idea, because such a patent "in practical effect would be a patent on the [abstract idea] itself." …"To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection." … Thus, a claim that recites a computer that solely calculates a mathematical formula … or a computer disk that solely stores a mathematical formula is not directed to the type of subject matter eligible for patent protection (citations omitted).

13. In the present case, the following analysis holds:

Claim 1 recites:

> 1. (Currently Amended) A machine-implemented method comprising:
>
> creating a sound by simulating self-sustained vibration of a ~~simulating a player blowing along a string of a musical instrument with a force acting on the~~ string having a movable end, the string subject to a force exerted by a stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string; and
>
> relating an excursion in time of the movable end to the force and relating movement of the string in time to the excursion of the movable end to simulate the self-sustained vibration; ~~and~~
>
> ~~simulating the movement of the string to cause generation of a sound~~.

Claim 1 is not statutory because it 1) is not a proper process claim, 2) is directed to abstract ideas, namely mathematical algorithms, and 3) pre-empts use of the claimed formulas.

14. For a process to be deemed patent-eligible under section 101, requires that two separate inquiries must take place Diamond v. Diehr, 450 U.S. 175 (198 1). The claim

must qualify as a "process," as that term has been interpreted by the courts (*Id.* at 181-84) and second, even if the claim satisfies the Supreme Court's definition for "process," the claim must then be evaluated for whether it is for an abstract idea, natural phenomenon, or law of nature. *Id.* at 185-93. When conducting the section 101 analysis, the claims must be examined "as a whole." *Id.* at 188.

15. Claim 1 is not a process claim as defined by the courts because it does not 1) recite a particular machine and 2) because the machine is incidental to carrying out the claimed method.

16. See Flook, 437 U.S. at 588 n.9 regarding recitations of particular machines ("this Court has only recognized a process as within the statutory definition when it either was tied to a particular apparatus or operated to change materials to a 'different state or thing.'") (citing Cochrane, 94 U.S. at 787-88). Also see Alappat, 33 F.3d at 1544 ("This is not a disembodied mathematical concept which may be characterized as an 'abstract idea,' but rather a *specific* machine to produce a useful, concrete, and tangible result." (emphases added));

17. See Diehr, 450 U.S. at 191-92 ("insignificant post-solution activity will not transform an unpatentable principle into a patentable process. To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection.")

18. A similar point was recognized in Flook, in which the Court concluded that the recitation of insignificant post-solution activity in a claim involving the solving of a mathematical algorithm could not impart patentability to the claim.

19. Furthermore, although structural limitations in method claims are not improper, they are usually not entitled to patentable weight unless they somehow affect or form an essential part of the process. See *Benson*, 409 U.S. at 73, 175 USPQ at 677; *Waldbaum*, 559 F.2d at 616, 194 USPQ at 469; *de Castelet*, 562 F.2d at 1244, 195 USPQ at 447.

20. The recitation of "machine implemented" in the claim merely refers to a device incidental to accomplishing the method.

21. However, even if the claim satisfied the Supreme Court's definition for "process," the second prong of the inquiry is whether the claim is for an abstract idea, natural phenomenon, or law of nature. *Id.* at 185-93. When conducting the section 101 analysis, the claims must be examined "as a whole." *Id.* at 188.

22. In this case, the claim is directed to mathematical algorithms. Claim 1 calls for a mathematical algorithm, namely that corresponding to solving for forced vibrations of a string.

23. As for claimed intended use for the formulas (see claim 1, for example – creating sound), see Diamond v. Diehr, 450 U.S. 175 (1981):

> A mathematical formula does not suddenly become patentable subject matter simply by having the applicant acquiesce to limiting the reach of the patent for the formula to a particular technological use. A mathematical formula in the abstract is nonstatutory subject matter regardless of whether the patent is intended to cover all uses of the formula or only limited uses. Similarly, a mathematical formula does not become patentable subject matter merely by including in the claim for the formula token post-solution activity such as the type claimed in Flook. Id. at 192 n.14

And see Diehr, 450 U.S. at 191-92 ("insignificant post-solution activity will not transform an unpatentable principle into a patentable process. To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection.")

24. Finally, it is noted that Applicants seek in these claims to pre-empt use of the equation itself. As noted above (see MPEP 2106):

> Even when a claim applies a mathematical formula, for example, as part of a seemingly patentable process, USPTO personnel must ensure that it does not in reality seek[]patent protection for that formula in the abstract." Diehr, 450 U.S. at 191, 209 USPQ at 10. "Phenomena of nature, though just discovered, mental processes, abstract intellectual concepts are not patentable, as they are the basic tools of scientific and technological work." Benson, 409 U.S. at 67, 175 USPQ at 675. One may not patent a process that comprises every "substantial practical application" of an abstract idea, because such a patent "in practical effect would be a patent on the [abstract idea] itself." *Benson*, 409 U.S. at 71-72, 175 USPQ at 676; *cf. Diehr*, 450 U.S. at 187, 209 USPQ at 8 ... "*To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection.*" *Diehr*, 450 U.S. at 192, 209 USPQ at 10.

25. Claim 19 includes steps identical to claim 1 in the body of the claim; the only difference between the claims resides in the preamble. Claim 19 is directed to a computer readable medium having stored thereon instructions comprising machine executable code which when executed by at least one processor, causes the processor to perform the recited steps.

26. Simply placing instructions on a computer readable medium, wherein the instructions are designed to perform mere manipulations of abstract ideas, does not convert an otherwise non-statutory method into patentable subject matter. Regardless of the format of the claims, they must still be examined as to whether the claimed computer readable medium falls under one of the judicially-created exceptions to patentable subject matter, i.e., laws of nature, natural phenomena, and abstract ideas. See Diehr, 450 U.S. at 185. There is no reason why placing instructions on a computer readable medium that cause a processor, when executed, to engage in manipulations of abstract ideas should be treated any differently from the method of claim 16.

27. In summary, the rejected claims as a whole are directed to the same mathematical algorithm in all independent claims, namely that of forced vibrations of a string.

28. Claims 36-43, 45 are determined to be statutory. See claim 36:

36. (Currently Amended) An apparatus comprising:

a processing element to simulate self-sustained vibration of ~~a player blowing along a string of a musical instrument with a force acting on the~~ string having a movable end, the string subject to a force exerted by a stream of a fluid medium flowing in a direction that has a component along a longitudinal axis of the string, the processing element further to relate an excursion in time of the movable end to the force and to relate movement of the string in time to the excursion of the movable end to simulate the self-sustained vibration;

a sound generating element, coupled to the processing element, to ~~generate~~ create a sound based on the self-sustained vibration~~movement~~ of the string; and

a storage device, coupled to the processing element, to store data used in simulation of the self-sustained vibration~~player blowing along the string of the musical instrument~~.

In this case, a real sound is produced and which corresponds to the results of the modeling.

Claim Interpretation

29. The definition for "self-sustained" is provided in paragraph 26 of the specification:

> [0026] Several methods for exciting such a simulated string and hence applying a force to the discrete elements are known. .... The term "self-sustained" is a specific term for an oscillation that is driven by a continuous energy source. In particular, self-sustained oscillations arise when a continuous energy source drives a resonator--such as a string under tension--by means of a non-linear energy coupling.

Claim Rejections - 35 USC § 102

30. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

31. A person shall be entitled to a patent unless –

> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

32. Claims 1-17, 19-34, 36-43, 45 are rejected under 35 U.S.C. 102(b)/103 as being clearly anticipated by Sapp (inventor), *or, in the alternative*, under 35 U.S.C. 103(a) as obvious over Sapp in view of Chin.

33. The 102/103 rejection is made because it is inherent to take into account boundary conditions and external driving forces when *solving* the wave equation. *The Examiner is aware that the background refers to two immovable ends for the string; however, these are arbitrary* boundary conditions*. The equations in the claims are identical to those disclosed in the background.* The choice of boundary equations does

not patentably limit the wave equation and merely depends upon the intended use of the "string" and its wave equation.

34. Sapp discloses (pp. 1-4 of the specification (background)) the *same exact equations* as claimed. The choice of boundary conditions constitutes an intended use. For examples, see equation 1 and claim 14:

The continuous wave differential equation for a stiff string with one degree of freedom is:

$$M\frac{\partial^2 y}{\partial t^2} = T\frac{\partial^2 y}{\partial x^2} - S\frac{\partial^4 y}{\partial x^4} + L_y\frac{\partial^3 y}{\partial x^2 \partial t} - L_x\frac{\partial^3 y}{\partial x^3 \partial t} - L_v\frac{\partial y}{\partial t} + F(x,t)$$

14. (Original) A method according to claim 5, wherein the wave equation is an approximation of the continuous wave equation

$$M\frac{\partial^2 y}{\partial t^2} = T\frac{\partial^2 y}{\partial x^2} - S\frac{\partial^4 y}{\partial x^4} + L_y\frac{\partial^3 y}{\partial x^2 \partial t} - L_x\frac{\partial^3 y}{\partial x^3 \partial t} - L_v\frac{\partial y}{\partial t} + F(x,t)$$

in which:

In another example, see equation 2 and claim 15:

$$\begin{aligned} y[n+1, j] = \quad & (y[n, j-2]\ c1 + y[n, j-1]\ c2 + y[n, j]\ c3 + y[n, j+1]\ c2 + \\ & y[n, j+2]\ c1 + y[n-1, j-2]\ c4 + y[n-1, j-1]\ c5 + y[n-1, j]\ c6 + \\ & y[n-1, j+1]\ c5 + y[n-1, j+2]\ c4) / M[j] \\ & + 2y[n, j] + F[n, j]/M[j] \end{aligned}$$

.....(Equation 2)

in which:

y[n, j] denotes the excursion of discrete element j in the y-direction at time n;

y[n+1, j] denotes the excursion of discrete element j in the y-direction at time n+1;

y[n, j+1] denotes the excursion of discrete element j+1 in the y-direction at time n;

15. (Original) A method according to claim 14, wherein the approximation of the continuous wave equation is the discrete recursion formula:

$$y[n+1, j] = (y[n, j-2]\cdot c1 + y[n, j-1]\cdot c2 + y[n, j]\cdot c3 + y[n, j+1]\cdot c2 + y[n, j+2]\cdot c1 + y[n-1, j-2]\cdot c4 + y[n-1, j-1]\cdot c5 + y[n-1, j]\cdot c6 + y[n1, j+1]\cdot c5 + y[n-1, j+2]\cdot c4) / M[j] + 2y[n, j] + F[n, j]/M[j]$$

in which:

dx = 1;

dt = 1;

y[n, j] denotes the excursion of discrete element j in the y-direction at time n;

y[n+1, j] denotes the excursion of discrete element j in the y-direction at time n+1;

In yet another example, see page 3 and claim 16:

More specifically, coefficients c1 to c6 can be calculated as follows:

c1 = -(S + Ls);

c2 = T + 4S + Lt +4Ls;

c3 = -(2T +6S + Lv + 2Lt + 6Ls);

c4 = Ls;

c5 = -(Lt + 4Ls); and

c6 = Lv +2Lt +6Ls

16. (Currently Amended) A method according to claim 15, wherein

c1 = -(S + Ls);

c2 = T + 4S + Lt +4Ls;

c3 = -(2T +6S + Lv + 2Lt + 6Ls);

c4 = Ls;

c5 = -(Lt + 4Ls); and

c6 = Lv +2Lt +6Ls.

35. In the alternative, Sapp discloses all limitations other than the boundary conditions and external forces (such as recited in claim 2, for example).

36. Chin discloses numerical modeling of a towed cable. Inherently, in a towed body arrangement, the cable is constrained at one end and not constrained at the other end. There are boundary and initial conditions as well as driving forces corresponding to the wave problem disclosed in Chin.

37. It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Sapp with Chin because they are both directed to numerical modeling of a "string" subject to longitudinal forces. Furthermore, towed cable modeling would constitute an intended and obvious use for the Sapp teaching. In modeling such an intended use, it would be inherent to constrain the "string" at one end and not at the other end. Furthermore, a recitation of the intended use of the claimed invention (using the wave equation (hundreds of years old) to model strings in musical instruments) must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim.

38. With respect to generating sound, Applicants admit:

> 17
>
> There are many different ways in which the simulated vibration of the string can be used to create sound. For example, the force that the string applies to the right-hand support 20 can be calculated. This simulates the way a violin or acoustic guitar works in terms of sound radiation. Another way is to simulate an electromagnetic pick-up such as that used for an electric guitar by taking into account only the vibration of one element or a weighted sum of the vibrations of several neighbouring elements. Such methods are well known in the art and need not be described further.

and (page 1)

It is well known that the oscillations of a vibrating string can be modelled and the results converted by into sound. Thus, the vibration of each of the strings of a stringed instrument can be modelled by a sound synthesiser.

There are several possible approaches to modelling a vibrating string, for example for use in sound synthesis. One such approach is to describe the modelled string by means of a differential equation, which can then be solved numerically by means of a standard iterative method using a computer. Thus, the wave equation of the modelled vibrating string is solved by iterative successive approximation, as discussed in "Synthesizing Musical Sounds by Solving the Wave Equation for Vibrating Objects": L Hiller and P Ruiz; Journal Audio Engineering Society, 1971, Vol. 19, pp 462-470 (Part I) and 542-551 (Part II). This Iterative

Clearly, the point of musical instruments is for the generation of sound.

Response to Arguments

39. Applicant's arguments, filed 7/2/2008, have been carefully considered and are not persuasive.

40. Applicants argue:

I. **Double Patenting Rejection**

Claims 1-17, 19-34, 36-43 and 45 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-30 of U.S. Patent Application No. 10/949,464, which has been issued into a patent (U.S. Patent No. 7,381,881) on June 3, 2008, and has the same assignee as the present application.

Applicant submits the claims of the conflicting patent and the current application, as amended, include distinct features. For example, independent Claims 1, 19 and 36, as amended, include the element of "self-sustained vibration," which is not present in the claims of the conflicting patent. Accordingly, withdrawal of the double patenting rejection is respectfully requested.

However, Applicant reserves the opportunity to file any appropriate response (e.g., a terminal disclaimer) in the event that the pending claims are otherwise allowable.

The definition for “self-sustained” is provided in paragraph 26 of the specification:

> [0026] Several methods for exciting such a simulated string and hence applying a force to the discrete elements are known. …. The term "self-sustained" is a specific term for an oscillation that is driven by a continuous energy source. In particular, self-sustained oscillations arise when a continuous energy source drives a resonator--such as a string under tension--by means of a non-linear energy coupling.

A stream of fluid (as in the copending claims) provides for a *steady-state driving force* – and causes ‘self-sustained’ vibration.

41. Applicants argue (pg. 16):

> Claim 1 is amended to more clearly point out that the subject matter of the present invention that Applicant seeks to claim. The background of Sapp discloses a number of sound synthesis methods that use a discreet recursion formula of a wave equation to simulate the movement of a string (paragraph 26). However, these methods do not produce self-sustained vibration of the string. The background of Sapp also discloses a common method for achieving self-sustained vibration of a string using bow pressure (paragraph 27), and another method for achieving self-sustained oscillation in wind instruments (paragraph 28). None of the methods disclosed in the background of Sapp creates a sound using self-sustained vibration of a string that is subject to a force exerted by a stream of a fluid medium.

:

The definition for “self-sustained” is provided in paragraph 26 of the specification:

> [0026] Several methods for exciting such a simulated string and hence applying a force to the discrete elements are known. …. The term "self-sustained" is a specific term for an oscillation that is driven by a continuous energy source. In particular, self-sustained oscillations arise when a continuous energy source

drives a resonator--such as a string under tension--by means of a non-linear energy coupling.

That is to say a *steady-state driving force* is applied.

42. Applicants further argue (pg. 16):

> Further, the string in the claimed method has a moveable end. By contrast, the string disclosed in the background of Sapp has two immoveable ends. The Examiner recognizes this difference, but asserts that the moveable ends of the strings are arbitrary boundary conditions of the equation disclosed in the background of Sapp (page 4 of the Final Office Action). Applicant submits that this "boundary condition" is not arbitrary as asserted by the Examiner. As described in the specification at paragraph, this "boundary condition" of the string is an element that allows self-sustained vibration to occur. There is no indication in the background of Sapp that self-sustained vibration of a string can be produced when an end of the string is set to a particular condition.

Self-sustained vibrations are caused by a steady-state driving force. The absence of such a force will lead to a decaying oscillation – no matter the boundary conditions.

43. Applicants also argue (pg. 16):

> The Examiner also relies on Chin for disclosing the modeling of the movement of a cable connecting a body and an airplane that tows the body. The Examiner characterizes the cable as the recited string having a moveable end. However, Chin does not disclose self-sustained vibration is produced on the cable as a result of the towing. Also, the towing action disclosed by Chin is unrelated to sound creation recited in Claim 1.

A stream of fluid (as in the copending claims) provides for a *steady-state driving force* – and causes 'self-sustained' vibration. No actual sound is created by the process of claim 1. Regardless, see Diehr, 450 U.S. at 191-92 ("insignificant post-solution activity will not transform an unpatentable principle into a patentable process. To hold otherwise would allow a competent draftsman to evade the recognized limitations on the type of subject matter eligible for patent protection.")

44. Applicants are requested to explain how they can carry out the simulation without use of the equations provided in the background of the specification. Applicants have been silent in response. Applicants have not invented a new wave equation, but merely used the wave equation and various initial and boundary conditions for, at most, a particular intended use.

Conclusion

45. Any inquiry concerning this communication or earlier communications from the examiner should be:

directed to: Dr. Hugh Jones telephone number (571) 272-3781,

Monday-Thursday 0830 to 0700 ET,

or

the examiner's supervisor, Kamini Shah, telephone number (571) 272-2279.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist, telephone number (703) 305-3900.

mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 308-9051 (for formal communications intended for entry)

or (703) 308-1396 (for informal or draft communications, please label *PROPOSED* or *DRAFT*).

/Hugh Jones/

Primary Examiner, Art Unit 2128

September 13, 2008